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Energy Supply Sector GHG Reduction Opportunities

The following tables provide examples of actions to reduce GHG emissions in the energy supply sectors. The first table covers actions in the electricity sector, and the second table covers actions in other energy supply. The list is neither exhaustive, nor are the categories necessarily distinct. The main goal is to provide a starting point for this process.

We have also included some examples of current activities in Arizona that fit under various categories. Again this is not meant as an exhaustive list. Instead it was developed from conversations with various Arizona experts and officials, combined with a review of relevant sources.

Key to Indicators: We have supplied indicative results for potential emission reductions and costs for some of the actions. These are rough estimates based on experience or studies in Arizona or elsewhere and are intended to start off discussion. Actual Arizona-based estimates will be developed for options that stakeholders decide to pursue in more detail, and may differ significantly from the preliminary indicators provided here.

Indicative Potential Emission Reductions* -

High (H): Potentially capable of saving at least 1 Million Metric Tons CO₂e per year by 2020 (~1% of current AZ emissions)

Medium (M): Potentially capable of saving from 0.1 to 1 Million Metric Tons per year by 2020

Low (L): Unlikely to yield more than 0.1 Million Metric Tons CO₂e per year by 2020

Uncertain (U): Too many unknowns to hazard a guess

** Several measures overlap in terms of the emissions they would reduce. They may target the same emissions sources, but using different implementation pathways. The estimates shown here assume that measures would be implemented independently from, or instead, of other measures.*

Indicative cost (\$/tCO₂e)

High (H): \$50/tCO₂e or above

Medium (M): \$5-50/tCO₂e

Low (L): \$5/tCO₂e or lower

Negative (Neg): option yields net benefits

Indication of Priorities:

- **High:** High priority items are deemed deserving of considerable further analysis.
- **Medium:** Medium priority items will be carried forward, with the extent of further consideration and analysis to be determined later.
- **Low:** Low priority items will be moved to a separate list as options to be potentially considered at a later time.

		Priority: High, Med, Low	Implement. Level & Lead	Potential Emission Reductions	Indicative Cost (\$/tCO ₂ removed)	Other Information, Co-benefits, Feasibility Consideration, Examples of Current Activities (currently only includes the latter)
1.	Electricity Sector					
1.1	Renewable and Low Emitting Energy					

		Priority: High, Med, Low	Implement. Level & Lead	Potential Emission Reductions	Indicative Cost (\$/tCO2 removed)	Other Information, Co-benefits, Feasibility Consideration, Examples of Current Activities (currently only includes the latter)
1.1.1	Renewable Portfolio Standard/Environmental Portfolio Standard (including consideration of an expanded EPS)			H	L	<p>Environmental Portfolio Standard (EPS): Utilities (not including SRP) must generate a specified percentage of their total retail sales from renewable energy:</p> <ul style="list-style-type: none"> • started in 2001 at 0.2% and increased annually to 1% in 2005 and will increase to 1.1% in 2007, expires 2012 • 2001 – 2003, 50% of Environmental Portfolio resources must be solar electric, remainder can be other environmentally friendly technologies including no more than 10% R&D • 2004 – 2012, 60% of resources must be solar electric • Environmental Portfolio Surcharge of \$0.000875 per kWh with caps by customer class <p>ACC staff recommendation for changes to EPS:</p> <ul style="list-style-type: none"> • 5% in 2015, 15% in 2025 • Solar electric requirement down to 20% of EP resources • 25% of EP resources from distributed renewables • 10% of EPS should come from RFP for renewable generation in 2006 and 40% in 2010 • Increase in Environmental Portfolio Surcharge caps

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1.1.2	Public Benefit Charge Funds			H	L	<ul style="list-style-type: none"> • ACC instructed utilities in 1999 to include a System Benefit Charge to fund renewable energy, environmental, demand-side management (DSM), low-income assistance, consumer education, R&D, and nuclear fuel disposal and power plant decommissioning programs • In 2001, the ACC allowed utilities to shift all SBC funds except low-income assistance to fund the EPS
1.1.3	Tax Credits and Incentives (for any renewable, including sales tax exemptions)			L/M	M	<ul style="list-style-type: none"> • One-time 25% tax credit on solar or wind energy devices, \$1,000 limit (residential) • Up to \$500 tax credit for converting a wood stove to a "qualifying wood stove" • 10% corporate or personal tax credit for the construction of a "qualified environmental technology facility" • State sales tax exemption on solar devices, up to \$5,000 • Revolving Energy Loans for Arizona (RELA), from \$10K to \$500K and up to 60% of project costs for manufacturers of renewable, alternative energy, or conservation equipment

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1.1.4	Green Power Purchases and Marketing			L/M – depends on technology & purchase level	L/M – depends on technology & purchase level	Utility programs: <ul style="list-style-type: none"> • EPS Credit Purchase Program: APS will purchase credits associated with operation of PV and solar hot water systems by their customers • SolarWise: SRP will purchase credits associated with operation of PV and solar hot water systems • Sunshare: TEP offers a buydown program for their customers to give financial incentive to install PV Cities: <ul style="list-style-type: none"> • Scottsdale purchases electricity from solar sources to power its civic center and library
1.1.5	Support for renewable energy development (zoning, siting, etc.)			U	U	
1.1.6	Advanced Biomass Technology support (e.g. Gasification)					
1.1.7	Biomass Co-firing at Coal Plants (also in Ag, Forestry, Waste)			M/H – depends on availability of biomass	L	
1.1.8	Research and Development (R&D)*			U (L in short term)	U	<ul style="list-style-type: none"> • Up to 10% of the EPS requirement can be met through research and development
1.1.9	Landfill Gas Recovery (see also Waste)			L	L	
1.1.10	Waste to Energy (see also Waste)					
1.1.11	Biomass support (ag, waste and forestry)					
1.1.12	Solar thermal technology support					
1.1.13	Solar PV technology support					
1.1.14	Low-head hydro					
1.2	Advanced Fossil Fuel Strategies					
1.2.1	Carbon Capture and Sequestration (CCS)			H	H	
1.2.2	Combined H ₂ /electricity production from fossil fuels with sequestration			H	H	
1.2.3	Advanced fossil technologies (e.g. IGCC)					

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1.2.4	Fuel Cell Development Incentives			L	H	
1.2.5	Tax Credits and Incentives					
1.2.6	Research and Development (R&D)			U (L in short term)	U	
1.3	Other Electricity Measures					
1.3.1	Efficiency Improvements and Repowering Existing Plants			U	U	
1.3.2	Nuclear Plant Relicensing and Upgrading					
1.4	Distributed Generation					
1.4.1	Combined Heat and Power Incentive Policies and Barrier Reduction			M/H	L	
1.5	Emissions Policies					
1.5.1	Utility sector GHG Cap and Trade			H	U	
1.5.2	Generation Performance Standards			H	U	
1.5.3	Carbon Intensity Target			H	U	
1.5.4	GHG Offset/mitigation requirements for new power plants					
1.5.5	GHG Offset/mitigation requirements for existing power plants					
1.5.6	Voluntary Utility CO ₂ Targets and/or Trading			U	U (typically L)	
1.5.7	CO ₂ Tax			L to H	L to H – depends on tax level	
1.6	Grid and Utility Policies					

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1.6.1	Interconnection Rules for clean, distributed generation*			U	U	<ul style="list-style-type: none"> Each of the major utilities has rules for DG interconnection (a DG working group developed a state-wide interconnection rule for the ACC, but it has not been implemented) The ACC requires that a line extension analysis be done for remote locations to compare the cost of a stand-alone PV system and line extension Maricopa Association of Governments has a standard for PV installation and interconnection, adopted by Scottsdale and cities in the Phoenix area
1.6.2	Remove Transmission and Other Barriers for Renewable and other Clean DG*			U	U	<ul style="list-style-type: none"> State law protects homeowners' right to install solar energy technologies
1.6.3	Net Metering			U	U	<ul style="list-style-type: none"> ACC Decision No. 52345 (1981) allows net metering for qualifying facilities of 100 kW or less, excess customer generation would be purchased by utilities at avoided cost SRP has a net metering program for residential customers with solar electric systems up to 10 kW TEP has a net metering program for residential customers with solar and wind systems up to 10 kW, with a maximum of 500 kW for all participants in the TEP service area
1.6.4	Pricing and metering strategies					
1.6.5	Remove Utility Rate Barriers					
1.6.6	Advanced Metering					

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1.6.7	Time-of-use Rates			U	U	CEC estimates 3 – 12% reduction in peak demand as result, emissions outcome ambiguous
1.6.8	Load Management (no clear GHG savings)			U	U	
1.6.9	Transmission System Upgrading			U	U	
1.6.10	Reduce Transmission and Distribution Line Loss			U	U	
1.7	Education and Awareness					
1.7.1	Brownfield Re-development			U	U	
1.7.2	Environmental (emissions) Disclosure			U	U	
1.7.3	Public Education			U	U	

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2.	Other Energy Supply					
2.1	Natural Gas System					
2.1.1	Leak reduction program					
2.2	Hydrogen					
2.2.1	Incentives for hydrogen development					